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21 September 1979

Worldwide Report

NUCLEAR DEVELOPMENT AND PROLIFERATION

No. 10

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WEST EUROPE

AUSTRALIAN MINISTER EXPLAINS SAFEGUARDS PACTS WITH U.S.,UK

Canberra THE AUSTRALIAN in English 24 Aug 79 p 6

[Text] The recently-signed nuclear safeguards agreement with the United States is expected to come into force in late October.

The Minister for Foreign Affairs, Mr Peacock, told Parliament yesterday the agreement was still before the U.S. Congress. It is the first agreement the U.S. has made under its Nuclear Non-Proliferation Act 1978.

In introducing the agreement to Congress, President Carter said it was appropriate that the first agreement under the new legislation should be with Australia, a country with impeccable non-proliferation credentials.

Mr Peacock said the agreement was the most advanced yet toward the goal of spreading nuclear non-proliferation.

The agreement not only incorporates all the requirements of the Australian safeguards policy but the extra safeguards added by the new U.S. legislation.

The agreement supercedes all previous agreements between the two countries on uranium sales.

The terms of the agreement include:

AN undertaking that material and equipment transferred under the agreement will not be diverted for military or explosive purposes;

THE application of the United Nations International Atomic Energy Agency safeguards to Australian-origin nuclear material in the U.S.

As a nuclear-weapon State, the U.S. is not required under the Non-Proliferation Treaty to institute IAEA safeguards in its territory.

But it has signed a voluntary safeguards agreement with the IAEA to provide for safeguards on its facilities "not of national security interest."

It has to be approved by the U.S. Senate before being brought into force.

The agreement provides that deliveries of Australian uranium under new contracts can only start upon enforcement of the IAEA agreement in the U.S.

SATISFIED

Other conditions include:

FALLBACK arrangements to ensure continued safeguarding of nuclear material should IAEA safeguards for any reason cease to apply;

PROVISIONS covering retransfer to ensure that uranium supplied by Australia is not re-exported by the U.S. unless Australia is satisfied as to the ultimate destination and the controls that would apply;

PROVISIONS on high enrichment and reprocessing to ensure these cannot take place unless Australia is satisfied about the arrangements and conditions.

This requirement reserves Australia's position on reprocessing, pending the outcome of international studies, and

PROVISIONS ensuring that adequate physical security will be maintained to guard against theft or other illegal use of nuclear material by groups or individuals.

The agreement also provides for exchanges of technical information and equipment between the two countries.

Mr Peacock said an agreement with Britain had also been signed during the parliamentary recess.

It included all the Australian safeguard provisions but accepted that Britain would also

have to meet its commitment to Euratom.

The agreement will be reconsidered in 1982 if a safeguards agreement has not been made between Australia and Euratom.

Britain will not take delivery of Australian uranium before 1982.

The Deputy Leader of the Opposition, Mr Bowen, said the Government was facing a conflict over its uranium policy.

He said on the one hand was the Deputy Prime Minister and Minister for Trade and Resources, Mr Anthony, who was willing to sell uranium to anyone, and the Minister for Foreign Affairs, Mr Peacock, who was then lumped with the responsibility of administrating safeguards.

The safeguards were not really effective at all, he said.

In the enrichment process overseas Australian uranium would inevitably be mixed with uranium from other countries.

INTEGRITY

"You have to rely entirely on the integrity of people in overseas countries and while you must attempt to do that it is still no way to ensure and enforce safeguards."

He said A.L.P. policy was that Australian uranium should be owned and controlled by Australia.

There had not yet been any satisfactory solution to the problems of nuclear waste disposal nor iron-clad security measures against re-routing uranium.

The threat from Pakistan had shown, he said, how dangerous the development of uranium for weapons purposes was to the world.

(230: 5100

AUSTRALIAN OPPOSITION LEADER ASSURES BONN ON URANIUM POLICY

Canberra THE WEEKEND AUSTRALIAN in English 4-5 Aug 79 p 7

[From Wellington Long in Bonn]

[Text]

THE Australian Leader of the Opposition, Mr Hayden, describing himself as "the alternative Prime Minister," says he is optimistic the security conditions his Labor Party recently set on the mining and export of Australian uranium can be met.

"Our policy is rigid," Mr Hayden told reporters. "We will not allow the mining or export of uranium until our security requirements are met. I have optimism that we can resolve these problems, and if our conditions are fulfilled, I would be happy to see the mining and exportation of uranium proceed."

Mr Hayden met the press after a lengthy meeting with the West German Minister of State, Mr Hans-Juergen Wischnewski, and with economic officials from the Foreign Ministry. The talks were held in the office of the Chancellor, Mr Schmidt.

"As the alternative Prime Minister, I gave them an insight on my views," Mr Hayden said.

He said the West Germans had been "concerned" about the Australian Labor Party's policies on foreign investment. "I pointed out that we need foreign investment in Australia, but that it is not unreasonable that we should want Australian participation maximised."

Fifty per cent Australian participation per project was "about right," Mr Hayden said, adding: "We have no intention of holding up any projects because Australian capital is unable or unwilling to participate."

After his talks in Bonn Mr Hayden will travel to France, Britain, the Soviet Union and Afghanistan.

In Paris, he will discuss energy problems with the Organisation for European Economic Co-operation.

CSO: 5100

AUSTRALIA-UK NUCLEAR PACT SIGNED AFTER YEAR'S DELAY

Perth THE WEST AUSTRALIAN in English 26 Jul 79 p 32

[Text] London, Wed: The last formal obstacle to the export of uranium from Australia to Britain was cleared yesterday.

The Foreign Minister, Mr Peacock, said he had signed a nuclear safeguard's and co-operation agreement with the British Foreign Secretary, Lord Carrington.

The two signatures signalled the end of a 12-month delay in completing the treaty. The delay arose when the European Economic Community refused permission for Britain to sign it alone.

The EEC Commission feared that its operation might conflict with provisions of the Euratom treaty covering free movement of uranium in the Community.

But the way was cleared for the final signatures when the British Prime Minister, Mrs Thatcher, called the EEC president, Mr Roy Jenkins, after returning from her weekend in Australia.

Britain expects to buy more than 1000 tonnes of uranium a year but the first delivery is not expected till 1981.

PROVISO

This delivery will depend on whether Australia has negotiated a treaty in the meantime with Euratom, the EEC's nuclear energy branch.

Mr Peacock said it was visualised that the treaty with Euratom would be in force by then.

He saw the agreement as particularly important because it was the first that Australia had signed with a member of the EEC.

It incorporated all Australian Government safeguards requirements as announced by the Prime Minister, Mr Fraser, in May 1977, Mr Peacock said.

As well as the clause allowing movement of the uranium between Euratom countries, there was a provision covering the enrichment and reprocessing of uranium.

The British Environment Secretary, Mr Michael Heseltine, said that at least 15 parts of Britain would be checked to determine if nuclear rubbish could be buried safely. Most would be in remote areas such as the Scottish Highlands.—AAP-AP.

CSO: 5100

AUSTRALIAN, BRITISH FIRMS TO COOPERATE IN URANIUM MINING

Canberra THE WEEKEND AUSTRALIAN in English 28-29 Jul 79 pp 1, 2

[Article by Ian Perkin]

[Text] The Australian Western Mining Corporation and the London-based multinational British Petroleum have joined forces in a multimillion dollar deal to develop Australia's uranium and coal resources.

The move comes only days after the British and Australian governments signed a bilateral agreement for the proposed sale of Australian uranium to Britain.

As BP is 51 per cent owned by the British Government the deal also offers Britain the chance of taking a position, indirectly, in Australia's home-based uranium mining lobby.

In two separate deals announced on Friday, it was disclosed that BP (Australia) Ltd, the local offshoot of the British firm, will take up a 49 per cent interest in Western Mining's highly prospective uranium, gold and copper claim at Noxby Downs Station in South Australia.

At the same time Western Mining has been given an exclusive option to purchase a 50 per cent interest in BP's big NSW coal producing operation, Clutha Development Pty Ltd.

Within hours of the announcement the South Australian Premier, Mr Corcoran, gave approval for the proposals and guaranteed security of tenure for the exploration licences.

But he said the two companies had also been warned of the Government's restrictive policy on uranium mining.

"Both companies fully understand the policy of the Government about mining and export of uranium, which requires that no mining, treatment or export of uraninum can take place until the Government is satisfied that it is safe to do so," he said.

"Both companies fully understand the policy of the Government about the mining and export of uranium, which requires that no mining, treatment or export of uranium can take place until the Government is satisfied that it is safe to do so," he said.

"The companies understand that there is no likelihood of a change in this safeguards policy taking place. The companies are willing to undertake the expenditure in return for security of tenure."

Friday's move follows closely the announcement by three UK utility companies — British Nuclear Fuels, the South of Scotland Electricity Board and the Central Electricity Generating Board — that they were looking for new uranium supplies overseas, including the possibility of entering into uranium mining.

The new relationship between Western Mining and BP (Australia) further cements the ties between the two companies.

They already have a major joint venture in Victoria exploring the extremely highly prospective Benambra copper, lead, zinc and silver deposit in the north-east of the State.

Western Mining is Australia's largest nickel producer, with wide ranging exploration interests around the country in other base metals and the Yeelirrie uranium prospect in Western Australia.

The corporation is virtually 100 per cent Australian owned.

British Petroleum, the UK parent of BP (Australia) is 51 per cent owned by the British Government.

Under the agreement the Australian company will retain control of exploration and development of the Roxby Downs prospect and a 51 per cent interest in the prospect.

But BP will take up a 49 per cent interest and will provide $80 million to meet the estimated cost of exploration, metallurgical testing and other work necessary to complete the feasibility study.

BP will also ensure that funds are available for the eventual development of a mine and facilities up to a production capacity of 150,000 tonnes a year of copper and associated products.

Western Mining's 51 per cent share of the required funds will be secured solely against project assets and will be repaid from the project's cash flow.

But BP also has the right to withdraw if it is unable or unwilling to go ahead for any reason.

This would include any impact of the South Australian Government's uranium mining legislation, which prevents all mining of the ore within the State.

The agreement between the two companies is still subject to the approval of both the Federal Government.

In the other half of the deal Western Mining also has an option to take up a 50 per cent interest in the coal mines, Clutha Development Pty Ltd, which BP bought from the Daniel K. Ludwig Group and associated companies several years ago.

Under the terms of that purchase, BP agreed with the Federal Government that it would resell 50 per cent of Clutha back to Australian interests before 1983.

It is understood that Western Mining's option over the 50 per cent Clutha purchase extends for 12 months.

At Roxby Downs BP will have the option until August 28, 1979, to take part in a joint venture with Western Mining in further exploration outside the Olympic Dam Prospect — the area at present being explored.

The exercise of this option would require BP to spend $10 million over the next three years.

By the end of this period BP may select up to 10 separate areas, each of approximately 0sq km in which to maintain its 49 per cent by spending a further $10 million in each area.

The remainder of the exploration area reverts solely to Western Mining.

CSO: 5100

AUSTRALIA, NIGERIA OPPOSE PAKISTAN'S NUCLEAR DEVELOPMENT

Perth THE WEST AUSTRALIAN in English 1 Aug 79 p 5

[Text]

LAGOS, Tues: Australia has asked Nigeria to persuade Pakistan not to go ahead with a nuclear-weapons development programme.

Nigerian officials said that the Prime Minister, Mr Fraser, raised the question during final talks today with president Obasanjo.

The officials said Mr Fraser feared that a nuclear weapon capacity by Pakistan could destabilise the whole of South-East Asia.

According to the Nigerians, the President told Mr Fraser he would do his best to dissuade Pakistan from going ahead with its programme.

He said that the matter affected the whole of Africa and not only South-East Asia.

Pakistan has refused to confirm reports that it is developing a nuclear weapons capacity.—AAP.

CSO: 5100

AUSTRALIA OFFERS TO FUND DOMESTIC URANIUM PROJECTS IN PHILIPPINES

Manila PHILIPPINES DAILY EXPRESS in English 27 Aug 79 p 16

[Text] Australia will shoulder half the cost of uranium exploration projects in the Philippines now being discussed between officials of the Philippine energy ministry and three Australian uranium experts, Australian Ambassador Richard Woolcott said.

Australia had also proposed a five-year, on-the-job training program in uranium exploration initially concentrating on survey techniques for Filipino geologists, he added.

The initial fuel supply for the Philippines' nuclear reactor, should its construction go ahead, will come from Australia under an agreement in principle reached between the two countries last year.

Under the agreement Australia is also to help the Philippines explore for uranium.

Construction of the reactor had been held up following a presidential order pending further inquiry into its safety following recent accident in a reactor at Three Mile Island, Pennsylvania.

Woolcott, meantime, noted that exports of the Philippines to Australia could reach nearly $82 million this year or more than three times their 1974-75 figure.

Addressing a seminar at which Australian officials are informing Filipino businessmen on how best to use the Australian tariff system, Woolcott said the rapid growth of Philippine exports to his country indicated the importance of its preference system.

Philippine exports in the 1974-75 financial year stood at 23 million Australian dollars ($25.3 million) and reached 57 million Australian dollars ($62.6 million) in 1977-78.

In the same period Australian exports to the Philippines grew from 99.7 million Australian dollars ($109.6 million) to 132 million Australian dollars (about $145 million).

At the end of this fiscal year, Philippine exports to Australia were expected to reach nearly 75 million Australian dollars ($82 million), Woolcott said. Projections of Australian exports for the same period were not available.

Woolcott said economic relations between Australia and the Philippines were now very active. Apart from the current seminar, a meeting is to be held next week of the joint trade commission set up under a trade agreement ratified last May during a visit of Australian Prime Minister Malcolm Fraser.

The agreement is designed to enhance still further the two countries' trade relations.

"Occasionally, one encounters critical comment on certain aspects of our civil aviation policy and of our trading relationship. But apart from the fact that at least some of these comments are based on misunderstandings, which I would hope this seminar will help dispel... Our network of contacts and our bilateral relationship is in a phase of vigorous growth," the ambassador said. (Reuter)

CSO: 5100

SOUTH AUSTRALIAN BAN ON URANIUM MINING SCORED

Deputy Prime Minister's Remarks

Canberra THE WEEKEND AUSTRALIAN in English 4-5 Aug 79 p 3

[Text]

THE South Australian Government ban on uranium mining and export will be lifted, according to the Deputy Prime Minister, Mr Anthony.

Speaking at an Adelaide Chamber of Commerce meeting on Friday, he urged the State Government to "unshackle" the mining industry.

"The ban on uranium mining in this State will be lifted," he said. "There's no way in the world it can stay.

"The world is irrevocably committed to nuclear power."

Mr Anthony warned that South Australia had virtually no economic future without mining.

Speaking of the Western Mining Corporation and British Petroleum's recently proven copper, uranium and gold bearing area at Roxby Downs Station, he said: "With Roxby Downs you're looking at a project which could be as much as half the size of the gigantic North West Shelf project, which is the most massive undertaking we've ever contemplated."

The ban on uranium in South Australia was costing that State thousands upon thousands of jobs, not only in mining itself, but in transport, construction and all the other areas of activity which mining generated.

The ban was a useless gesture hurting no one but the State and the nation, he said.

"For South Australia to sit back while the rest of the world surges ahead into the nuclear age suggests to me that there is an appalling lack of realism in the Government here as to what is going on in the world," Mr Anthony said.

Roxby Downs could be South Australia's Pilbara. "I'm told there could be more copper at Roxby Downs than there is at Mount Isa and everywhere else in Australia put together," he said.

"There could be more uranium at Roxby Downs than there is at Ranger, Jabiluka, and Nabarlek combined. In fact, at Roxby Downs you're sitting on top of a gold mine.

"The trouble is the gold is mixed up with the uranium and copper. And under the present South Australian policy, the copper and gold must stay in the ground along with the uranium.

"This means at a time when both copper and gold are bringing higher prices – gold is at record prices – this State has a policy which unless it is changed, will keep those two metals in the ground.

"I commend the courage which Western Mining and British Petroleum are showing in pressing ahead with their exploration at Roxby Downs in spite of the ban on mining.

"It seems to me that someone really needs to take a more realistic look at the matter.

"People who are elected to govern have got to have the resolution to make decisions that best meet the needs of the people they represent."

Political Potential Analyzed

Canberra THE WEEKEND AUSTRALIAN in English 4-5 Aug 79 p 13

[Article by Peter Ward: "Uranium, the Ugly Step-sister"]

[Text]

IT was once called the Cinderella State by one of the Dunstan Government's detractors, but South Australia is beginning to find more than blacking in its cinders.

The normally conservative Western Mining Corporation has found promising indications of a major coal deposit in the south-east of the State, locally known as the Green Triangle, that has clearly heartened Deputy Premier and Mines and Energy Minister, Hugh Hudson.

It is early days yet, he has said, but any indication of another energy source is welcome news for South Australia. Western Mining's news (the prospect could be proved within several months) is just another indication the Government's mining and mineral situation is building up into a real area of potential political conflict for the Corcoran Government as it presides over a State now harshly affected by the recession.

Not that there'll be much trouble in the Green Triangle, but the news comes within several weeks of Mr Hudson's announcement that his Department of Mines and Energy had uncovered "new and convincing data" that would encourage an expansion of petroleum exploration in the State.

That was the result of the department sinking an exploratory well on the fringe of the Officer Basin in the State's far north and, just to complicate matters, in Aboriginal territory belonging to the Pitjantjatjara people.

"It is possible there is a significant accumulation of oil and gas in the Basin," Mr Hudson said, going on to sound optimistic about solving the inevitable problem of Aboriginal land rights, a bill for which is before State Parliament.

But the most sharp-edged conflict of interest and policy for the Corcoran Government is that of Roxby Downs, long the subject of Opposition attacks on a government that is ideologically divided – despite denials – on the matter.

And this week it came to a boil again in the reaction to Western Mining Corporation's announcement it had joined British Petroleum in a joint exploration costing an initial $50 million to investigate the full potential of the Roxby Downs uranium, copper and gold deposits.

Present indications are the orebody is between 200 and 500 million tonnes which, with associated smelters, treatment plants, and a Mt Isa sized township, is the kind of project SA's languishing economy dearly needs.

But the trouble is the Corcoran Government's anti-uranium policy, and it could, in the great washup of things, split the A.L.P. as badly as ever the DLP managed to do.

Faced with the fact Mr Hudson and the Government at large have given the nod to the joint venture partners to go ahead with their three-year exploration program, anti-uranium forces in the A.L.P. have started agitating to prevent the move from being, in any way, the thin end of the wedge.

The Corcoran Cabinet is lined up in a way worth putting on record.

In the middle are the pragmatists who will hold the party line with varying degrees of enthusiasm and expediency: they are Premier Corcoran, Geoff Virgo (Transport), John Cornwall (Environment), Don Hopgood (Education), Brian Chatterton (Agriculture), Ron Payne (Planning), and "Bud" Abbott (Community Welfare).

To the left are the hard-line forces: Attorney-General Chris Sumner, Peter Duncan (Health) and Don Simmons (Chief Secretary).

Between them, testing the wind and worrying the bone, are Jack Wright (Labor and Industry) and John Bannon (Community Development).

And finally, over on the right, bound by party policy which he follows to the letter but about which he remains basically unconvinced as realistic, is the SA Cabinet's only real expert on all the associated issues of uranium mining and export, the Deputy Premier and Mines and Energy Minister, Hugh Hudson, himself.

A lonely position, perhaps, but one which he no doubt expects, by about the mid-1980s, will be quite comfortably crowded.

CSO: 5100

BRIEFS

NUCLEAR WASTE STORAGE--A Griffith University research team is studying the possibility of storing nuclear waste in glass ingots more than a kilometre underground. The team has received a $200,000 research grant from the Australian Institute of Nuclear Science and Engineering. Professor Robert Segall, Dr. Sverre Myhra, Dr. Roger Smart, Dr. Peter Turner, and Mr. David Cousins, will work with the institute and use the facilities of the Australian Atomic Energy Commission. The team is researching the possibility of storing nuclear waste in three metre high by a metre wide glass ingots. These could be buried in groups of 50 to 100 in Central Australia. The ingots must be buried in geological formations which have little likelihood of being disurbed by natural phenomena such as earthquakes. The research team has developed a new method to simulate the effect of 500,000 years of radiation damange on the rate at which the glass ingots will disintegrate. Results of the research, which will be based at Griffith University, are expected to be known by the mid-1980's. [Excerpts] [Brisbane THE COURIER-MAIL in English 28 Jul 79 p 21]

EFFECTS OF RADIATION--What were thought to be acceptable levels of radiation for people working with radioactive materials were now considered too high, a seminar at the West Australian Institute of Technology was told yesterday. Dr K. Roby, the senior lecturer in the school of mathematical sciences, said that evidence of this was emerging from studies of uranium miners, of people who had lived in the downwind path of atomic bomb explosions and of workers engaged in construction of nuclear submarines. It suggested that there was a greater level of cancer and leukaemia among people exposed to low levels of radiation than had been expected. Dr Roby, who has just returned from a conference on energy at the Massachusetts Institute of Technology, was speaking at a seminar on non-nuclear energy for the future, arranged by the science, technology and public-policy group of the WAIT and student guild. The International Commission on Radiological Protection had already suggested that the acceptable levels were about 10 times too high, Dr Roby said. But if that was generally accepted, it would have serious economic implications for the industry. [Text] [Perth THE WEST AUSTRALIAN in English 31 Jul 79 p 20]

BRISBANE ANTINUCLEAR MARCH--Anti-nuclear protesters have been given a permit for a march through Brisbane on August 9, the anniversary of the bombing of Nagasaki. The Queensland Campaign Against Nuclear Power had earlier been denied permission for a march on Monday, Hiroshima Day. The campaign had asked for a permit for a march at 5.30 p.m. on Monday. The application was refused, and the refusal was confirmed by the Police Commissioner (Mr. Lewis). But yesterday an application for a march over the same route, at 6 p.m. on Thursday, was granted. Co-ordinator of the campaign (Mr. Bruce Doyle) said later that some of the conditions imposed by the police were "absurdly strict." "The police say that we can march only three abreast, and can carry placards no more than 610 millimetres square," he said. Mr. Doyle said he believed the police might have agreed to the second march as a means of heading off an illegal procession after an anti-uranium rally on Monday. [Excerpts] [Brisbane THE COURIER-MAIL in English 3 Aug 79 p 9]

CSO: 5100

HEXAKETONE USED FOR SEAWATER URANIUM RECOVERY

Tokyo KYODO in English 0754 GMT 5 Sep 79 OW

[Text] Kyoto, 5 Sep KYODO--Japanese scientists have succeeded in extracting uranium directly from seawater using a chemical compound they synthesized for the first time, it was learned here Wednesday.

Kyoto University's faculty of engineering group, including Prof Iwao Tabushi, made polymer-bound macrocyclic hexaketone of petroleum and acetylene. Hexaketone adsorbs uranyl ion in seawater.

The researchers succeeded last spring in extracting 18 micrograms of uranium dioxide from 18.5 liters of seawater, using hexaketone and treating it with dilute acqueous said [as received] solution.

Their achievement appears in the August 23 issue of the science magazine NATURE.

Attempts to extract uranium from seawater have previously been concentrated on the method using the adsorbent hydrous titania sorber.

This method takes time and results in large loss of titania sorber. It has been estimated that 68 pounds are needed to produce one pound of uranium. The new method is more efficient and the hexaketone does not dissolve in water and is stable chemically.

The Kyoto University scientists estimate they will be able to extract uranium three times greater in weight than the hexaketone used in the new method and the cost of uranium will be about three times of the present method.

Prof Tabushi said: "Hexaketone is very expensive since it is synthesized of chemical reagents now. Its price will come down when it is mass-produced." "One ton of seawater contains 3.3 milligrams of uranium. If we float a raft, one kilometer in length and 200 meters in depth, equipped with our uranium extracting system, in the Pacific, it will produce enough uranium to meet the demand in Japan," he added.

CSO: 5100

OPPOSITION TO NUCLEAR WASTE MOVE

Port Moresby POST-COURIER in English 12 Jul 79 p 8

[Text] Wellington, Wed, AAP--French parliamentarians would oppose the dumping of American nuclear waste in the Pacific if it put island populations in any danger, the leader of a visiting French delegation, Mr Bernard Marie, said here yesterday.

He was comenting on American plans to dump nuclear material in a lagoon in the Palmyra Islands, north of the Cook Islands.

Mr Marie said he could not speak for his Government as the delegation comprised members of all parties in the French Parliament, but he personally believed if studies showed such deposits would endanger the population of the area, the parliamentarians would disapprove of it.

CSO: 5100

BRIEFS

DPRK NUCLEAR SCIENTISTS--RADIO MOSCOW reported on 17 August that a group of North Korean nuclear scientists and scientists from 10 other communist countries are conducting research on the use of nuclear energy at the Dubna Joint Nuclear Research Institute located in the suburbs of Moscow. [Text] [Tokyo THE TONG-IL ILBO in Japanese 23 Aug 79 p 2]

CSO: 5100

GENERAL ZIA'S 'ISLAMIC BOMB'

Madras THE HINDU in English 26 Aug 79 p 5

[Text]

ACCORDING to the local guidebook, the town of Kahuta near Islamabad, the capital of Pakistan, is a quiet place with a skyline broken by several Sikh and Hindu temples.

There is nothing to suggest, it says, the pre-partition horrors of 1947 when the town was the scene of serious inter-communal fighting between Muslims on one side and Sikhs and Hindus on the other.

What the guidebook fails to mention however is that to-day Kahuta is where Pakistan is believed to be building a gas centrifuge uranium enrichment facility capable of producing weapons grade uranium.

A few days ago, Mr. Charan Singh, Prime Minister of India, said his country would go ahead with developing an atomic bomb if Pakistan continued its own programme.

Senior Pakistani officials were quoted as saying also that a decision on whether to explode a peaceful nuclear device would be left to civilian politicians after elections in November.

Pakistan's nuclear plans have provoked mounting international concern. The U.S. has stopped all aid (except food) to Pakistan and withdrawn an offer to sell F-5 fighter-bombers. Pakistan is now defending Kahuta and a pilot enrichment plant at Sihala with missiles and aircraft.

Israel has expressed concern that a Pakistani weapon would be made available as an Islamic bomb to the Arab countries.

Meanwhile Pakistan's ambitious plans continue. Last month General Zia ul-Haq said the nation would eat crumbs rather than allow the national interest of acquiring nuclear technology to be compromised.

The Pakistanis continue to insist that they do not intend to produce nuclear weapons. The programme is simply to meet Pakistan's energy needs.

Investigations in Pakistan and Britain show that

- The main conduit for the supply of equipment is a body in Rawalpindi named the Special Works Organisation (SWO). Its function is to procure materials for the manufacture and support of Pakistan's nuclear facilities.
- Pakistan's buying of equipment for its nuclear plant has continued despite a British Government ban on the export of some items.
- These purchases have been made through two related companies in Swansea and in London.

The orders have links with other purchases made in Europe as part of an operation controlled by a Pakistani scientist who is believed to have acquired secret information from a uranium enrichment plant in Holland.

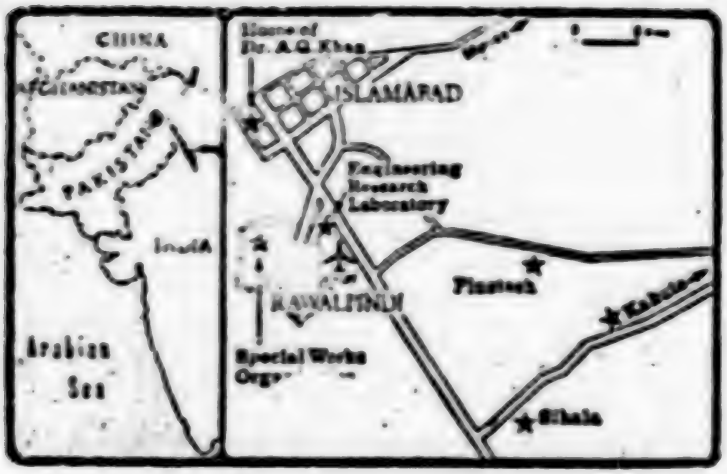
Pakistan's purchases first came to light last year when Mr. Frank Allaun, chairman of the Labour Party and MP for Salford East, pointed out that equipment known as frequency changers or inverters being made at Emerson Electrical Controls of Swindon for Pakistan could be used with gas centrifuges. The other, worth £1.23m was going through Weargate of Swansea. The British Government banned its export, but Weargate says it has continued to sell other non-restricted goods.

Purchases of other equipment have also been made. Inverters from Emersons were ordered through West Germany for shipment to Pakistan and were delivered before the British Government ban. Rotors for centrifuges were bought elsewhere in Europe. High vacuum valves came from Switzerland, as did gas handling units which were required for vaporising uranium hexafluoride to be processed in the centrifuges.

Although Pakistan's budget allocation for its nuclear programme is only Rs. 320m a year it is clear that much more is spent.

The Kahuta building site is spread over hundreds of acres, probably accounting for more than the official nuclear budget by itself. There are residential and other buildings under construction, and a dam with six slipways.

According to diplomats work at Kahuta comes under the



Special Works Organisation at 169 Kitson Road, Rawalpindi, the military town next to Islamabad. In July this year the SWO placed notices for tenders in the local Press for the transport of 5,000 tonnes of cement before the end of the year to "work sites 35 km from Rawalpindi", a description which fits Kahuta. The cement alone is worth Rs. 30 lakhs.

The Special Works Organisation is the body to which Weargate Ltd. of Swansea says it has sold Rs 130 lakhs worth of machine tools and other equipment during the last 18 months.

The man in charge of the SWO is Brigadier Anis Ali Syed — an American-trained engineer who was deputy director of military operations in the Pakistan army until appointed in June last year. He visited Britain from December 4 to 24 last year "on official business".

Other visitors to Britain last year were two retired army officers working for the Pakistan Atomic Energy Commission, Major Muhammed Sadiq Malik, a procurement officer, and captain Fida Hussein Shah, an assistant administrative officer.

The two men, who were also travelling to Switzerland, said they were to expedite the delivery from England of machinery and lathes which had been procured and arrange for its shipment via Pakistan International Airlines.

In response to questions by British officials they said all arrangements had been made by their project director, Dr. A. Q. Khan. They gave the company they were to visit as S. R. International of Clovelly Avenue, London SW.

Dr. Khan is the Pakistani scientist who used to work in Holland and is now believed to be in charge of the uranium enrichment programme.

There is no Clovelly Avenue listed in southwest London. The only Clovelly Avenue is in Colindale, London NW9. But when Major Malik returned for a second visit to England in December 1978, he again gave his destination as S R International of London SW.

S R International or Source Reliance International of Clovelly Avenue, London NW9 operates out of number 27. Its directors are a Mr. and Mrs. Abdus Salam who live next door at number 25. Mr. and Mrs. Salam also own 66 per cent of the Swansea company, Weargate.

Mr. and Mrs. Salam are at present on holiday in America and last week an employee of the company refused to answer any questions about it.

In Pakistan last month a spokesman for the Pakistan Atomic Energy Commission denied that Dr A Q Khan worked there. But there is no doubt of his links with the nuclear research programme.

During a visit to an installation called Engineering Research Laboratory (ERL) at Islamabad Airport in June my colleague, Chris Sherwell, was told that Dr. Khan was a co-director of the establishment.

ERL is believed to be the transit point for nuclear-related equipment flown in from Europe by Pakistan International Airlines. It is now guarded by plainclothes security men.

There is also little doubt about the sensitive aspects of Pakistan's projects. The French Ambassador to Pakistan and his first secretary were beaten up after driving past Kahuta in June. The Financial Times correspondent Chris Sherwell was attacked three days later outside the house of Dr. Khan in Islamabad.

Pakistan's nuclear ambitions are believed to stretch back 15 years when a 5MW American-supplied research reactor began operating at PINSTECH, the Pakistan Institute of Nuclear Science and Technology, just outside Islamabad.

A Canadian-built 127 MW power reactor began operating in Karachi in 1971. However, when India exploded a nuclear device in 1974 it became clear that Pakistan cherished the same ambition. Unfairly in Pakistani eyes, Western help dried up, supplies of fuel for both reactors were cut off and training of scientists stopped.

An even greater blow came last year when the U.S. persuaded France to stop building a nuclear reprocessing plant which would have given Pakistan access to plutonium.

Essentially there are two ways of making an atomic bomb, with supercritical masses of either plutonium or highly enriched uranium. Pakistan, it was thought, was left with no option but to pursue the second method. Contracts for the French deal, formally exchanged in June 1976, had already begun to go foul by October that year. Preparations for uranium enrichment seem to date from soon afterwards.— Financial Times.

CSO: 5100

FOREIGN EXPERTS TAPPED TO REVIEW BATAAN PLANT

Manila PHILIPPINES DAILY EXPRESS in English 21 Aug 79 pp 1,6

[Text] The Commission looking into the safety of the Bataan nuclear power plant chose yesterday four foreign geology and seismology experts, three Americans and a Japanese, to serve as an international review panel for the commission.

Justice Conrado Vasquez, one of the commissioners, said the experts will be invited to come to the Philippines and help the commission decide the safety issue, particularly the risks connected with the location of the plant in an earthquake and volcanic area.

One of those chosen, Dr James Devine, is a member of the United States Geologic Survey office, one of the agencies which reportedly recommended the freezing of an export license to Westinghouse Electric Co because of site safety questions.

Other international panelists to be invited are Drs J. C. Stepp, director of geosciences of Furgo Inc in Long Beach, California; N.M. Newmark of the University of Illinois; and M. Watoe of the International Institute of Seismology and Earthquake Engineering, Tokyo.

Meanwhile the opposition and the government panel at the public hearings at the Philippine International Convention Center are hurling charges of contempt of court at each other.

Former Sen Lorenzo M. Tanada scored the National Power Corp officials and their seismology consultants from Ebasco Services Inc, for holding a press conference last Saturday and attacking hearing witnesses and proceedings.

Spokesmen of the NPC, on the other hand, said that Tanada also held a press conference in Washington, D. C., where he said the commission was not doing a good job.

Justice Minister Ricardo Puno gave the parties 15 days to file their motions and counter motions on the matter.

ENERGY Minister Geronimo Velasco confirmed yesterday the resumption of limited construction activities at the Bataan nuclear power plant site.

Velasco clarified, however, that construction resumption will be confined to buildings and structures that may be utilized for non-nuclear installations.

He said President Marcos has ordered the continued suspension of the construction of the plant's reactor building which is designed to contain the nuclear reactor or the primary nuclear system.

He pointed out that the structures where work has been resumed include the wharf, generator building, auxiliary building, the water system which can all be used by another power plant system other than nuclear.

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PRESIDENT MARCOS has ordered that laborers return to work on non-nuclear facilities on recommendation of the commission.

Opposition leaders complained that they were not informed of the commission's recommendation concerning construction resumption. Until yesterday, Tanada said, they had yet no information on the recommendation or the back-to-work order of the President.

Earlier, both the Tanada panel and the participating government agencies were asked to "show cause why the commission should not recommend to the President the resumption of construction. . ." Tanada and Bataan Assemblyman Antonino Roman objected. The NPC and PAEC were in favor of resumption.

Tanada said the commission should have informed them of the resolution of the motions and responses on that issue.

Puno, on the other hand, brushed off complaints and said he sent the recommendation in the form of a report to the President and not a formal commission resolution.

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BRIEFS

KORI N-PLANT SHUT DOWN--The commercial operation of the nation's first atomic power plant at Kori, Kyongsang Namdo, along the southern coast, will be suspended from Oct. 28 through the end of the year for a technical reason, sources at the Ministry of Energy and Resources said yesterday. The temporary suspension of the nuclear power plant with a rated generating capacity of 587,000kw is necessary to replace one third of the nuclear fuel for the atomic reactor, they said. The Kori atomic power plant went into full commercial operation on July 20 last year and since then has been supplying about 10 per cent of the nation's total electricity requirement. The Kori power station was forced to suspend its generation activities four times between March and May of this year. [Text] [Seoul KOREA HERALD in English 17 Aug 79 p 2]

NUMBER 5, 6 NUCLEAR PLANTS--The Korea Electric Company (KECO) and Westinghouse Electric Corp. of the United States have agreed that 10 per cent of the equipment and facilities to be used in the construction of the nation's Nos. 5 and 6 nuclear power plants will be produced locally, KECO officials said yesterday. The officials said that the 10 per cent localization ratio was fixed to help Korean firms boost their nuclear industry technology. Westinghouse began construction early this year on the two nuclear power stations with a rated generating capacity of 900,00kw each. Earlier, Westinghouse had requested that the localization ratio for the two nuclear power plants be only six per cent, the officials added. The state-run KECO is now negotiating with Westinghouse to increase the localization ratio to 15 per cent for the nation's Nos. 7 and 8 nuclear power plants, for which Westinghouse is likely to be the major contractor, they explained. [Text] [Seoul KOREA HERALD in English 17 Aug 79 p 2]

CSO: 5100

CRITERIA FOR EVALUATING RADIATION HAZARDS IN NUCLEAR FACILITIES REVIEWED

East Berlin KERNENERGIE in German Vol 22 No 3, Mar 79 pp 94-98
manuscript received 28 Aug 78

[Article by F. W. Krueger, GDR State Bureau for Nuclear Safety and Radiation Protection, East Berlin: "Radiation Hazard and Its Evaluation for Nuclear Facilities." The article is a revision of two lectures presented at the 2d scientific meeting of the GDR Society for Radiation Protection, held in November 1977, and at a colloquium of the III Zittau, May 1978]

[Abstract] The state of the art in the measurement and evaluation of hazards resulting from the operation of nuclear facilities is reviewed on the basis of references in the literature with the aim of establishing the extent to which an assessment of the hazards could contribute to the establishment of protective regulations (for example mandatory safety-prevention equipment such as shielding and decontamination). Economic and statistical methods are widely used to assess the significance of the risks and the cost-effectiveness of proposed measures aimed at reducing the hazards. At the present state of the art, these methods still yield rather uncertain results. However, they do provide a better insight into the causes, probabilities, and consequences of various dangers, as well as into the effectiveness of proposed preventive measures. Since many subjective criteria and assumptions are included in the calculations, the method of cost-effectiveness will not yield entirely objective results. Thus, the measures aimed at reducing the hazards must also consider relevant experience, expert opinions, politico-and socia-economic considerations, and engineering analyses. Conclusions based solely on the latter factors permit objective evaluation of the hazards and their comparison with hazards created by other technological operations. The economic approach should be used for the assessment of the proposals based on these conclusions, rather than for creating the proposals themselves. Summarizations of reports dealing with these matters were presented in the article to demonstrate the validity of the conclusions outlined (such as analysis of radiation deaths, release of radioactive iodine isotope, and cost/experience comparisons). Figures 5; table 1; references 26: 19 Western, 1 German, and 6 Russian.

CSO: 5100

BEHAVIOR OF A NUCLEAR POWER PLANT IN A LOSS-OF-COOLANT ACCIDENT STUDIED

East Berlin KERNENERGIE in German Vol 22 No 5, May 79 pp 160-164
manuscript received 25 Apr 78

[Article by E. Adam and H. Carl, Dresden Technical University, Energy Conversion Department; and K. Kubis VEB Bruno Leuschner Nuclear Power Plant, Greifswald, Rheinsberg Branch: "Behavior of a Nuclear Power Plant With a Pressurized Water Reactor in a Loss-of-Coolant Accident." This article is a revision of a lecture presented at the 9th Power Plant Engineering Colloquium of Dresden Technical University, 19-20 October 1977, in Dresden]

[Abstract] Accidents in the operation of nuclear power plants in general, and accidents caused as a result of coolant loss in particular, cannot be analyzed in the usual manner, namely evaluation of past accidents. Instead, theoretical considerations and scientific considerations are used to fortell possible accidents so that they can be studied. In a loss-of-coolant accident, the major hazards are release of heat and radioactive materials. For a study of such accidents, the processes taking place in the reactor leading to loss of coolant must be studied. These processes have been extensively discussed in the literature. Once an accident involving coolant loss has occurred, the performance of the containment system becomes very critical. In general a loss-of-collant accident may occur if one or more of the limit values of the following are exceeded: pressure in the system area, pressure in the operating area, coolant content in the volume compensator, pressure in the coolant loop of the reactor, and activity in the safety containment space. Most expected damages occur in the in-pile loop. The accident is usually triggered by breaks in the coolant pipes; secondary difficulties are created by damage in the core. The effectiveness of the emergency cooling system is a critical factor in containing the accident. An analysis of roughly 1,500 operation years of nuclear power plant operation indicates that severe loss-of-coolant accidents should be rare occurrences. The analysis also shows that the theoretical design considerations employed in the designing, building, and operation of a nuclear power plant are on the conservative side, meaning that the

typical nuclear power plant has an adequate safety reserve. Of course, this safety factor increases the downtime of an operating reactor, which in turn represents major economic losses. Overall, the probability of an individual being fatally injured in a loss-of-collant accident is thought to be in the same order of magnitude as the probability of being killed by a meteorite. The study deals primarily with pressurized water reactors. Figures 6; references 15: 12 German and 3 Western

CSO: 5100

DAMAGE TO STEAM GENERATOR TUBING IN PRESSURIZED WATER REACTORS STUDIED

East Berlin KERNENERGIE in German Vol 22 No 4, Apr 79 pp 118-126
manuscript received 23 May 78

[Article by D. Pastor and K. Oertel, VEB Bruno Leuschner Nuclear Power Plant, Greifswald: "Behavior of Boiler Tubes in Steam Generators of Pressurized Water Reactors (Progress Report)"]

[Abstract] The literature dealing with boiler-tube performance in the steam generators of 26 pressurized water reactors, all of which were started up before 1972, was reviewed. All major reactors of this type now in operation are included in the survey; they employ either vertical U-tube or horizontal single-pot steam generators. The major fault reported was stress-corrosion cracking, primarily encountered in the tube bottom, just above the tube bottom, and in the sharpest tube bends. No fatigue corrosion was observed in the headers; this was attributed to the beneficial effects of the baffling between the tubes (usually made of criss-cross lead strips). It was concluded that corrosion damage occurs most frequently in those areas of the tube bundle where the flow conditions are unfavorable, where bulky deposits may form, and were high fabrication stresses exist. The incidence and/or severity of stress corrosion is attributable to various factors such as the use of not entirely suitable materials of construction (Inconel appears to be the best suited among those encountered) and the water treatment (OH and Cl ions appear to be particularly harmful; phosphate buffering does not constitute adequate protection; the so-called all-volatile treatment [AVT] appears to yield the best results). Especially effective measures in the area of water treatment include those which reduce the formation of porous deposits and sludge, and those which prevent the development of unfavorable flow conditions. The mechanism of stress-corrosion development is thought to be either the formation of so-called dry spots (with cyclic wetting and evaporation processes) or the so-called Macbeth-model process (localized boiling within the pores of a deposited layer). According to a recent proposal, addition of small quantities of EDTA [ethylenediaminetetraacetic acid] would ensure that only an unsaturated solution of corrosion products and hardness-forming agents circulates within the steam generator, and that--as a result--the tendency of deposit formation is drastically reduced. Figures 3; tables 5; references 54: 19 Western, 1 Bulgarian, 6 Russian, and 28 German.

CSO: 5100

RECENT DEVELOPMENTS IN CSSR NUCLEAR PROGRAM

Peaceful Nuclear Energy Discussed

Bratislava PRAVDA in Slovak 17 Aug 79 p 1

[Excerpts] We took the first steps toward the industrial use of nuclear energy in this country in the early 1960s. At the end of last year we achieved another important success when, with the effective assistance of the Soviet Union, we put the first section of the V-1 nuclear power plant into operation in Jaslovske Bohunicia. At present this section is already reliably "feeding" our electric system. A second section of equal capacity is to be added to this first 440-megawatt section by the end of the year. The V-1 nuclear power plant with its output of 880 megawatts will become the basis not only of the powerful nuclear power complex we are building in Jaslovske Bohunicia, but of the development of nuclear energy throughout Czechoslovakia as well. By 1990 another 10 sections with VVER-440 reactors are expected to be in operation, for which the Czechoslovak machine industry will, according to Soviet data, supply the major technological equipment. Also anticipated to be in operation by 1990 are four to five reactor sections with an output of 1000 megawatts each. The total output of nuclear power plants should reach over 10,000 megawatts in 1990. In accordance with worldwide trends, the output of nuclear power plants should increase by a factor of two or three in the following decade, that is, by the year 2000.

The reserve of fossil fuels to be used in supplying power are concentrated in one main area in the country, the North Bohemian brown coal region. With an annual coal output of approximately 80 million tons, this area will enable us to satisfy the fuel requirements of existing electric power plants for the next half-century. But we will need many times this amount of electric power. Nor is there any way reserves of the best sources of energy, oil and gas, can satisfy increased energy needs. We overcome this shortage through imports for our national economy. At present, however, not only are imports of these energy raw materials growing steadily, but also their prices on the world market.

This is precisely the reason that the rapid development of nuclear energy plays such an important role in our fuel-energy balance.

For Czechoslovakia, and basically for every country developing a peaceful nuclear program it is important that nuclear power plants produce not only electricity, but heat in the form of steam and hot water for industry and communal residences as well. It is therefore expected that all nuclear power plants being built at present will supply hot water for homes to at least nearby towns. As early as this year, the Czechoslovak Energoprojekt and the Soviet Teploenergoprojekt are scheduled to complete a type project of a nuclear power plant which will provide hot water. The design is based on two nuclear reactors of the type VVER-1000 capable of supplying steam for distances of up to 15-20 km and hot water up to 30-50 km.

In addition to these major uses of nuclear power, another use is also being actively developed in Czechoslovakia. It is by its nature peaceful, extremely beneficial and holds out great promise for the future. This is the use of radioactive nuclides, ionizing radiation, and nuclear technology being employed in the most diverse sectors of the national economy: in science, research, industry, agriculture and even in medicine.

The production of isotopes, their practical utilization and the use of ionizing radiation dates back to 1910 in this country, when radium began to be produced in Jachymov. More intensive development began only in the fifties when the USSR began to supply us with artificial radioactive nuclides. Blocked operations, neutron sources and special organic compounds began to appear. At the present time, the preponderance of this work is done at the Institute for Nuclear Research in Rez, near Prague. Approximately 500 centers are currently using radioactive nuclides and ionizing radiation. Fluorination, a process derived from the technology of treating nuclear wastes, has resulted in savings in the millions for the national economy. This process is used in the chemical industry in the manufacture of rubber, gasoline, and nitric acid. Irradiation can be used to polymerize plastics and to improve the properties of wood; in the national enterprise Kablo, in Vrchlabi, radiation vulcanization is employed. Neutron activation analysis helps to determine, for example, the degree of wear of blast furnace linings; it is also used by geologists to determine the quantity of different metals in rock and mineral samples, and it helps ecologists to establish the major sources of atmospheric pollution.

It was due to the use of radioactive isotopes that objective examinations were made simpler in health care. Radiopharmaceuticals replace painful examination procedures and help in following not only the condition, but also the functioning of a given organ. In 1971, 43,000 of our citizens were examined in this manner, while in 1976 there were already over 200,000, and in 1980 it is expected that half a million citizens will be examined by this method. The methods of nuclear medicine can produce a more accurate and reliable diagnosis than other methods. All these methods are less demanding on the patient, and the radiation risk is insignificant, usually being less than that associated with the widely-used X-ray exam.

The same can be said about other applications of the new methods. Since 1973 there has been an industrial plant in operation in Veverska Bytiska for irradiation sterilization. They sterilize dressings, operating gloves, transfusion apparatus and other medical equipment in the radiation chamber.

Radioanalytic methods are employed not only in human medicine, but in veterinary medicine as well. They are used for diagnosing infectious diseases and the information obtained with their help make it possible to accelerate the reproduction of the herd, and so forth. One of the successes of Czechoslovak science in this area has been the development of a method of testing for Aujez' disease in swine. Valuable results have been obtained in genetic improvement through radiation mutation. By the use of this method, more than 130 agricultural products have been developed throughout the world. There are not many who realize that this is how the spring barley variety Diamond originated in this country and served as the basis for quite a number of other varieties, for example, Favorite, Amysthest, etc. The ability of ionizing radiation to destroy microorganisms and to influence vital processes has also been made use of by the food industry in food preservation.

In recent years the possibility of using the waste heat of nuclear power plants for agricultural intensification has been intensively studied. This heat, which is dissipated in the cooling towers of the reactors, will amount to the equivalent of nearly 60 million tons of brown coal in the 1990's.

The increased use of nuclear methods has significantly affected and will continue to affect our energy supply; it is contributing to the advancement of the biological sciences. Nuclear methods are expanding the frontiers of the understanding of biological processes. They are helping to improve health care, and are playing an important role in insuring the country's food supply. In accordance with international policies, the CSSR, consistently respecting international agreements about the nonproliferation of nuclear weapons, is discovering new horizons for the peaceful use of nuclear energy.

Charged Particle Accelerator Testing

Prague SVOBODA in Czech 2 Aug 79 p 2

[Text] Testing of the U-120-M isochronic electron accelerator has been completed by the Institute for Nuclear Physics of the Czechoslovak Academy of Sciences.

This charged particle accelerator, the largest in Czechoslovakia, was built at the Joint Institute for Nuclear Studies in Duben. Now in continuous operation, it will be used primarily for investigating the nucleus of the atom, and also for producing radioactive isotopes for medicine and industry, as well as in research in other areas of science and technology.

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SCIENTISTS DISCUSS DEVELOPMENT OF NUCLEAR ENERGY

Belgrade EKONOMSKA POLITIKA in Serbo-Croatian 30 Jul 79 pp 17-21

[Edited version of joint interview with representatives of three institutes by staff members of EKONOMSKA POLITIKA: "A Test of Knowledge and Development"; date and place not given]

[Text] If a program is being prepared for the development of nuclear power in Yugoslavia, in what stage is that preparation? What premises concerning raw materials, supplies, technology, the institutional framework, specialized knowledge and personnel have been adopted as its basis? What direct impact might the construction of nuclear power capabilities have on the linkage of our science, technology and industry, to name the most important sectors? What has been the experience in the joint work of institutes in this field? We took these questions as the topic of a conversation we had with representatives of three institutes: from the Jozef Stefan Institute in Ljubljana Dr Boris Frlec, director; Dr Milan Copic, chief of the reactor department; and Dr Milan Osredkar, staff adviser; from the Rudjer Boskovic Institute in Zagreb Vojno Kundic, graduate engineer and director, and Dr Petar Tomas, professor and staff scientist; from the Boris Kidric Institute in Vinca near Belgrade Dr Predrag Anastasijevic, assistant general director, and Dr Naim Afgan, professor and staff scientific adviser. We publish their responses in a freely edited version.

EP: Our energy needs are growing very rapidly, which accounts for the turn to alternative sources--nuclear above all. Yet this choice raises a number of dilemmas for the public to which science ought to have at least partial answers.

Dr Naim Afgan: I see three reasons why Yugoslavia has shown a greater interest in development of nuclear power. The first is the need for energy. In a number of studies we have established our raw materials for energy production and their geographic, physical and technological availability. The

studies make it clear that our sources available at present will not be adequate to meet future needs. We therefore state that the right moment has come for adoption of nuclear power in Yugoslavia. In drawing up their energy budgets some republics (Slovenia, Croatia and Serbia) have realized quite clearly that the orientation toward this energy source is indispensable. This will probably be the case with the other republics as well.

Now that we have seen that nuclear power is necessary in the country's energy system, the next question is how to develop that energy in a truly comprehensive way. It is this that led us to reflect about a unified program, since nuclear technology has certain altogether inherent features requiring that it be viewed in a comprehensive and long-range context. The very breadth of our scope committed us to examining what important interests are integral to the development of nuclear power. We have seen, as in fact they have seen in other fairly advanced countries, that as nuclear power develops, we can also develop industry, thereby making it more advanced and raising it to a higher level to meet the demands of nuclear power. Its production opens up an entire range of possibilities to our machinebuilding, power machinebuilding, chemical technology and a number of other industries which could be involved in this process. In equipping themselves to enter into the development of nuclear power, they are equipping themselves for a broad range of products. And this is the second reason for working on a program for the long-range and comprehensive development of nuclear power.

I would cite the development of technologies as the third reason. I intentionally do not say "sciences," since science develops on its own. I see in the development of new technologies a lively possibility for the involvement of our scientific facilities, and in this context I see the development of institutes in the field of nuclear science.

This kind of comprehensiveness demands answers to several questions: production of nuclear raw materials, the meeting of certain political conditions which are today in effect concerning nuclear power, and a way of accomplishing that development under the political conditions now prevailing in the world. I think we can give an affirmative answer to this. After all, we must develop such a vital sector as energy on the basis of our own technology if not on the basis of our own raw materials. This compels us to examine the problem of nuclear fuel in all its breadth. So it is not just a question of finding it as a source of energy, but also of utilizing it in a thoroughly comprehensive way.

Dr Boris Frlec: Every decision of this kind has to be made in a political and economic context and in the context of actual execution. The latter context would include our actual production and organizational capabilities, possibilities for obtaining knowledge from others, and so on. I think we must first be clear about who is making the decision and who knows something about nuclear power. First there are the political people who know how to go about things. Then there are the people from the economy who know the capabilities of their factories, but they do not know exactly what the discussion is about. Finally there are the people engaged in science who know

precisely what it is about. Their knowledge is already being summarized in various studies which have been prepared. This includes suggestions as to the field in which action should begin.

Once we have these parameters, we should ask the main question--Is our economy capable of development?

The introduction of nuclear power is a necessary prerequisite [original reads "prerogative"--translator's note] for development of the economy. The economy develops only if it has energy. So there is no need to debate whether that development is necessary or not. So the economic question (I won't go into the political questions) comes down to the extent to which our economy will develop. But aside from that it is clear today that a nuclear program is an important part of the energy program. There is also a need for the federal units to join forces within the framework of the nuclear program. Perhaps we do not have the right information, but I would like to ask whether it is possible that certain large sources of energy, the Kolubara Basin, for example, will not be used exclusively for our own needs. If there are dilemmas about that, if we face questions like that concerning existing sources of energy, that is, those which were here before us, then there is no point in our talking about a nuclear program, since we will never carry it out.

EP: Even among the experts there is not complete unanimity about the pace and extent of nuclear power use. That is probably why we note more and more people favoring coal and thermal electric power plants rather than nuclear power.

Dr Milan Osredkar: I think that attention should be called to the following things in connection with energy. First, it is true that we do have coal, quite a bit of it. But the economics of its utilization has not in my opinion been sufficiently worked out, nor has a system of relations among all members of the Federation been worked out concerning coal. To illustrate this I would mention that talks are being held with the Swiss about the use of coal in Kosovo at the very time when we are all talking about the energy shortage. Probably that will not come about, but only if we succeed in drafting a unified program.

Next, now that we are talking about coal, we should also mention other sources of energy--solar, wind, geothermal, and so on. But it must be recognized that none of the other forms of energy yet has the technological development behind it which nuclear power has, and nothing can be done without that. So, we can confidently say that we need several more decades before the other forms of energy will have the same significance in terms of meeting needs.

It is clear that nuclear power must be balanced against other forms of energy in order to arrive at its share. But we should also emphasize the need for discussion and agreement, which are indispensable here. I think it a

pity that reality has not compelled us to work agreements of this kind in other areas as well. The nuclear program is still the only one whose goal is sufficiently defined or whose definition is nearing completion. In that respect it is the only such program in the entire country.

This brings us to the question of the participation of our own engineers and researchers. We can develop the technology--behind technology stands science--only if we have large programs. If there are no programs, science remains at the level of partial research projects. Here I am thinking first of economic programs and then of scientific programs. It is this aspect which makes the existing nuclear program so extremely important, since that is a program we know that we need more than ever, since we know that we must develop technology, either our own or acquired, and any technology degenerates if it develops without science.

Even though we have not developed the nuclear power plants which were conceived some 15 or 20 years ago, there has been an obvious benefit from the investments in the research institutes. Though we have not built the power plants, thanks to the work of institutes the scientific spadework has been done in a number of activities--the science of materials, ceramics, and metallurgy. The research done by the institutes has produced evident results in the chemical industry, computers, electronics, medicine, and so on. This research was done on behalf of the nuclear programs, so that the funds were nevertheless invested in a way which included the posing of criteria, and they yielded a benefit.

EP: Will the speed of introduction of nuclear power depend on the pace at which domestic capabilities enter into nuclear technology and into the construction of components for nuclear power plants?

Osredkar: I think it will be the other way around. The development of nuclear power will depend on the pace with which the economic program is built up and still more on policy, i.e., on whether that policy will be different from the policy in other areas where we are importing diverse technology on a large scale. Everyone knows about the case in Slovenia where three manufacturing organizations applied to the same enterprise in Germany to purchase the same technology. Until we agree to change that situation, we will not be able to develop in other fields either. Our industry will lag behind, and so will our technological and scientific research.

Vojno Kundic: It seems that we must keep coming back to the same initial question, which we have already resolved--Are we going to carry out a nuclear program or not? We need to demystify certain views and teach people what we mean by nuclear technology and nuclear power engineering. We might note in passing that we cannot say that we know everything even about thermal electric power plants, since we are purchasing even them abroad from different manufacturers in different sizes and with differing systems.

At this moment there is still fear of nuclear power plants. We should, then, look into the source of that frame of mind, which begins first with the notion that we supposedly do not have the trained personnel, that we are not economically strong, that we do not have enough of resources of other kinds, and that all in all we can put things off awhile. In overall terms we may go a few points slower on an annual basis, but this cannot happen with nuclear power, though there are those who say that precisely nuclear power must be postponed. No one has made such a decision, but there is still talk to that effect. For example, we are told the cost per nuclear unit of 1,000 MW, but no one is telling us the cost of thermal electric power plants of the same capacity in one of our coal basins.

Someone here has mentioned the possibility that one of our large coal basins might be used for export. If those thermal electric power plants are to be built, we should bear in mind that if we want them to be as clean for the environment in normal operation as nuclear plants are, then the thermal electric plants will cost quite a bit more to build and operate than is frequently indicated in comparisons. However, these are all arguments for debating points while the elements on which the nuclear power plants should be built have already been confirmed and defined. Yet even today we are returning to the questions which have already been given precise answers insofar as they could be given. I could have understood the rationale of an antinuclear program 15 years ago, when nuclear power was competition for petroleum. But today there is no reason whatsoever for such an attitude, especially not in our self-managed socialist society.

Dr Predrag Anastasijevic: In the world today there are already 370 nuclear power plants with tremendous installed capacity. This construction is going so rapidly that 32 countries have already built nuclear power facilities, which indicates that the world is counting seriously on nuclear power as the only serious and tested technological source. It is in this same light that we should look on all the technological and engineering efforts to perfect the technology so as to move on to the second stage, construction of fast breeders, which multiply the reserves contained in nuclear ores by several factors of 10. This is the inevitable next step because of the ever growing hunger for energy.

It is characteristic of our own country that we have not been aware of a fact, of the truth that the future is always different from what it once was. Some 10 or 15 years ago we could assume that we had unlimited amounts of coal, since at that time we were consuming from 5 to 7 million tons per year. But when our needs increased to the point of planning to consume between 200 and 250 million tons annually in another 10 years, then it is clear to everyone that by the decade 2050-2060 we will no longer have coal. This means that we will not be able to build thermal electric power plants after the year 2020. It is clear, then, that we must gradually undertake the introduction of nuclear power plants, as we have all agreed.

The second question which has been raised here and which has not been dealt with fully is the conduct of that policy. In view of our engineering and technological development we are no longer in a position today where we can allow the introduction of power plants of different types into our electric power system, not even in the construction of thermal electric power plants. We are aware that we must develop our own machinebuilding for the development of thermal electric power, and we dare not allow what is happening in Kosovo and Kolubara, where we have a family of thermal electric power plants of different types and systems, since this has proven to be very expensive and practically impossible to maintain, since we are talking about units with large capacity.

Osredkar: Nor dare we commit ourselves to finance German, French, Czech or some other science in making our purchases abroad. When we buy foreign technology, we are supporting science in nearly the entire world, and we are fooling ourselves to think that our science is expensive, while elsewhere it is cheap. We are not developing our own abilities, yet our specialists are competent.

Another thing which has not been mentioned, and I think it is very important, is energy conservation. We have not begun to think about this at all. For instance, we just passed the buildings of several banks--al glass. So we are wasting energy. In summer we cool the buildings, in winter we heat them. At least 5 years have passed since I began to propose that we amend the codes in Slovenia. Nor have we taken any far-reaching steps to make our present heating more efficient. I am thinking of higher efficiency as a very important source of energy. We are making preparations, but so far we have not taken measures toward higher efficiency.

Dr Milan Copic: In Slovenia the Committee for Energy, in collaboration with the Business Community for the Fuel and Power Industry and the self-managed community for energy research, has prepared a conservation program which was adopted and submitted for consideration to the Federal Committee for Energy. Yet in practice this is very difficult to accomplish. Although it has been adopted, the program is still being put into effect very little or not at all, since it necessitates that people look differently on the entire problem of energy, and this is still not understood. The time of cheap energy has passed long since. But that change has still not hit the pocketbook hard enough for us to completely grasp this fact.

It is difficult to alter certain conditions and habits. After the war hydropower was the principal form of energy. Do you remember the squabbles when thermal electric power plants began to be built? The transition from the use of one form of energy to another gives rise to a number of difficulties not only with respect to the new technology, but also in habits.

EP: What experience has been gained in designing and building our first nuclear power plant?

Copic: The transition of present-day technologies toward quality forms of energy makes it imperative that that kind of energy be guaranteed in the future; otherwise we cannot provide for the technological development of an industrial country nor of a developing country like ours. That is the role of nuclear power. That is what makes the experience of the Krsko Power Plant interesting. When construction of this power plant began, the situation in the world was quite different. Under an agreement between Slovenia and Croatia Krsko was conceived as a facility approached in exactly the same way as all other facilities built by the electric power industry. That is, it is customary for the electric power industry to build more or less all its facilities with the efforts of its own group of design organizations, its own institutes, in accordance with the old principles.

Thus the first source of nuclear power went under construction in the context of the old methods of management, of operation, and of relations to other social forces and to industry. People were accustomed to ordering a boiler or turbine, as we have already said, from one, two or three large manufacturers guaranteeing delivery date, price, reliability, and all other conditions. That was the practice of the electric power industry in this case as well, in the expectation of obtaining as soon as possible a facility which would go on line at the earliest date. The principal conditions which were set in construction of the nuclear power plant did not allow for our industry to be involved. Westinghouse even assumed an obligation under the contract to involve our industry, but it was unable to fulfill that obligation because of the tight deadline, insufficient respect for our construction conditions, the change of designers during construction, and so on. It is no wonder, then, that institutes not directly involved in that contract, just like industry, were not involved to any great extent in construction of that facility.

The recent conference in Portoroz demonstrated some of these problems. It showed that neither industry nor the institutes were satisfied with their participation in carrying out that project. This is an important public issue--How are all those facilities to be linked up on a project whose significance is not limited to that of one electric power project? Only now, following the abrupt change in the international energy situation, because of the necessity of having a long-range policy concerning nuclear power in Yugoslavia and in the world, has it been understood that this is an energy project involving broader and long-term interests. This is a process whereby the problem undergoes public examination. We might say that even this examination is still relatively limited in its scope, confined as it is to the context of the electric power industry. It still has not taken on all its significance and breadth in terms of policy and public information.

There is also the question of the life of nuclear power plants. I am aware of several different lives of power plants--the financial life depends on creditors, on the contract, and there are 5-year and 15-year credits, so that for the first 5 years the cost of power from Krsko is considerably higher than later. There is also the engineering life and the design life.

At present we cannot say that any nuclear power plant has served out its entire life. Nuclear power plants are developing at present rather rapidly in engineering terms as well, and the life of the individual components is being established only as this experience accumulates. For example, it turned out that Westinghouse steam generators were suffering because of damaged piping, and Westinghouse developed a technological procedure whereby the interior of the steam generator could be changed in the plant itself, thereby extending its life.

The recent incident with the nuclear power plant in America contributed to accumulation of practical experience, which serves as the basis for technical measures, equipment and regulations. Wherever any problem has occurred, a new regulation has also been adopted. Should this be used as an argument against nuclear power, one must examine where the causes and conflicts come from, what it reflects in German or American society, which forces are those taking advantage of it and for what purpose? It is instructive to examine what the Germans themselves have written about the burger initiative and to see how the burger initiative is now being used against nuclear power.

If now we return to home ground and our previous context, the most important experience in building our first nuclear power plant is that the reliance on domestic capabilities was not sufficient. The opinion has prevailed too long that an American supplier and consultant is the only one who can solve these problems, which are so specific and new. When the power plant goes on line and when Yugoslavs have to run it according to Yugoslav regulations, it is certain that this will show up even more, that is, there will be more difficulties.

Some problems have even arisen because it was thought that everything would proceed automatically, but that is not the case. That is why a considerable effort has been invested in preparing the program on nuclear power, which places reliance on our own capabilities. On what we can, should and must provide for development of our own power and industry.

Friec: When we say "reliance on our own capabilities," we do not mean that we will do everything ourselves, but that we will involve everyone who can contribute to an autonomous decision, one that is optimal in view of our capabilities, rather than to a decision which emerges from a limited circle at some distance from the situation.

EP: Are the nuclear institutes capable of solving the problems of nuclear technology and the nuclear fuel cycle?

Osredkar: I would like to say something about the participation of institutes in building the Krsko Power Plant. Back in 1971 and 1972 the institutes concluded a contract with the investor concerning long-term cooperation. We need to ask why everything provided for in the contract was not carried out?

We reached agreement on four essential areas. The first was protection of the environment from radiation. This is a job in which the institutes have experience and on which they have all worked all these years, and they prepared their report and made their contribution to what had been manufactured under American regulations. Now these things will be made in accordance with Yugoslav regulations. The second area is analysis of safety, an area in which we collaborated in working out free-construction safety, and we furnished the first assessments and reports. In this area even more could have been done. The third area is fuel and fuel utilization, on which little was done. The reason lay in a mistaken conception of the programs on both sides. The next area of cooperation was personnel training. According to the program of the principal supplier, Westinghouse, we prepared courses for operators and system maintenance. Some of the courses were given at our reactor, the rest in the United States. Some personnel are now being prepared in Vinca, so that all three institutes have collaborated in training personnel. A separate area among the other activities of the institutes where we rendered services was work on the automatic weather station.

The reason why more was not done within the framework of the projected program was a failure to grasp the breadth of the problems in introducing a completely new technological system in the country. We hope there will be a change for the better and that future development will be better planned.

Frlec: Under the given conditions and taking into account the contract with the supplier of equipment, the deadline, and the habits of the electric industry and the group of investors, and then the tradition of the institutes and the preparedness for cooperation, it was not possible to do more. Krsko asked our institute for more trained people, researchers to work on the power plant, but we could not allow this, since the institute would have lost its physiognomy, perhaps entire departments. I think this is not the reason for the institute's existence, nor its public significance. This is another case in which much was learned by the electric power industry, by the investors and by the institutes, and it will be possible to do better work in the future. What was most lacking in all of this was a long-range policy, which today can be better conceived in the framework of the program. I would like it if in future, when a new facility is being prepared, needs for personnel from the institute are indicated earlier.

Prof Petar Tomas: First a few words about the role and cooperation of the R. Boskovic Institute with the investor in building the first nuclear power plant--Krsko. The fact which staff members of the J. Stefan Institute recounted also applied to our institute, along with certain specific features. There was no offer or request from the investors, as far as I know, which our institute did not respond to promptly. A new self-management accord is about to be signed, and it will provide a good self-management foundation for long-term cooperation in the very serious problems of nuclear power in the future. At the beginning there were not enough three-way contacts and agreements among the investor and the J. Stefan and R. Boskovic institutes. These oversights have been corrected long since, and the triangle with polyvalent connections is beginning to function. Neither the institutes, nor

the investor, nor the inspector's office have a sufficient number of specialists (critical mass) for solving the specific problems. But task forces are rapidly being set up to solve the overall problems thanks to a pooling of funds and personnel by the institutes, the universities, and the electric power industry, and various republics are involved.

Improved awareness of these problems and principles in practice is the answer to some of the questions asked at the beginning of these conversations. After the accident in Pennsylvania, after the ban on putting a power plant on line which had already been built in Austria, and the delays in completing new power plants and putting them on line in a number of countries, the question arises whether the priority task of our three nuclear institutes at this moment is to build the heavy components of a nuclear power plant, or, on the other hand, systems engineering, greater involvement in preparation of the design for the new power plant, preparation of studies aimed at proper site location, and study of the N triple S (NSSS) as a comprehensive, highly complex and interdependent system with high redundance. We should not at all costs set ourselves the priority task of mastering the expensive and inaccessible technologies of the various stages of the fuel cycle but should rather concern ourselves with sensible and optimum handling of the nuclear fuel at the Krsko Nuclear Power Plant, based on a good knowledge of neutron and reactor physics and a complete familiarity with the mathematical models and computations.

The answer to the question of projecting the growth of nuclear power is also needed in order to complete preparation of a good and complete long-range program and a plan for scientific research in this field. At the present level of technological development, unfortunately, we have no other alternatives at this point than to look to thermal electric power plants, using at the same time the abundant domestic coal deposits, which are not of high quality. Coal-fired thermal electric power plants are the striking force for development of our electric power industry up to the end of the century, combined with gradual use of energy from the fissioning of uranium by slow neutrons. In this connection it is indispensable to measure very carefully and strictly the factors of risk and availability, reliability and safety.

Projection of the growth of nuclear power in our country is bound up with the increase in the number and capacity of nuclear power plants in the world. It is difficult at this point to make a real assessment of energy needs. If we exclude the impact of the recent reactor accident in the United States, which is still being evaluated, we can say that by the end of this century the capacity of nuclear power plants will be doubling about every 10 years. So, toward the end of the century there would be about 3,000 gigawatts of installed primary capacity in nuclear power plants (the gigawatt is a billion watts). This means, then, about 1,000 plants with an average unit capacity of 1,000 MW of installed electric power. The estimate is subject to a 10-percent error for 1999 and about 20 percent for the year 2000.

When our first nuclear power plant, Krsko, goes on line, Yugoslavia will take its share in production of electric power from nuclear fission that corresponds to the place in the world which it has on the basis of its economic potential. In order to determine the growth of needs more accurately, we need to know the growth rate of the population, the growth of the planned social product, the pattern of consumption, and the possibility that the so-called "soft technologies" (use of solar energy, geothermal energy, etc.) will take their place in meeting primary energy needs. Should these factors be established, then it is a matter of using mathematical methods already developed to determine the growth curve of the needs for nuclear power plants.

Energy conservation will contribute particularly to the preservation of our limited primary energy reserves if the basic laws of thermodynamics are respected in energy conversion. Energy has the wonderful property that it can be transformed without loss from one form to another, but unfortunately energy is degraded in this process according to the basic law of entropy (disorder is more probable than order). The key scientific basis affording a possibility of energy conversion lies in the efficiency of energy conversion from one form to another. A department of our institute known as the "Physics, Energy and Application" OOUR [basic organization of associated labor] has proposed one such program for scientific research in the field of energy.

The role of the nuclear institutes and the desire for every investment in large machines, even accelerators (not only reactors) in the field of nuclear power show a tenfold return can be specifically proven in the example of the five Zagreb accelerators. Use of these machines in research and application in just two areas, isotope production and tumor treatment, as well as the measurement of nuclear-technological data, demonstrates this assertion unambiguously. The role of accelerators in more efficient use of existing uranium reserves (electrobreeding) and also in research reactors for controlled fusion of hydrogen isotopes is well known.

We should emphasize once again the importance of basic long-term research such as the valuable knowledge gained concerning neutron-neutron interaction, discovered and measured in our institutes for the first time in the world. Precise knowledge of the basic laws of matter are a most important precondition for solving concrete technological problems in the energy field. In spite of the large investments in the field of fusion reactors, there is still a question mark concerning a technological solution until the basic laws of matter's behavior in a plasma become known. Certainly the precise program of world research has made it possible to obtain accurate knowledge of the analytical expression for the forces of gravity. The question is whether a knowledge of the basic laws of symmetry and better familiarity with the nature of nucleon-nucleon interaction and the nature of the nuclear forces, along with familiarity with the nature of nuclear transformations, will make our task easier in better and more efficient use of the great stores of energy imprisoned in the depth of the atomic nucleus.

Kundic: On the question of why greater reliance was not put on our own capabilities, it should be said that the reliance has not been greater on other installations and projects either, and this applies to both research capabilities and industrial capabilities. We thought that this would work itself out, but now it is clear that that is not the case.

Anastasijevic: The nuclear institutes have created the Community of Nuclear Institutes, which previously did not exist. Now we have formed our own association and are working on a joint program. We have taken a step further concerning other structures; we have agreed on the division of tasks related to the nuclear fuel cycle. We know what each institute will specialize on in the future.

In the case of Krsko we did not have a long-range research program. But now, thanks mainly to our initiative, we can look farther into the future concerning the commitment of our research capabilities. Now we all understand that we must take another step into a broader phase of pooling research capabilities, machinebuilding, and so on. This task, which involves reaching agreements with machinebuilding and the electric power industry, now confronts us.

We should also bear in mind that we should develop certain sensitive technologies of the fuel cycle which we cannot purchase. After all, the great powers are still maintaining their monopoly in certain fields, which we must investigate on our own. In nuclear power the essential thing is precisely what cannot at present be purchased. This is what the institutes should do, but this requires cooperation with a competent machinebuilding industry and power machinebuilding.

Perhaps we should be more outspoken in explaining the advantages which nuclear power has for us. In all our papers the conclusion is that nuclear power plants should be introduced. By the year 2005 the plans call for construction of some 10 of them. But this is only the first phase of a program. We have not conceived the second phase. Nor has it been examined in Europe as a whole. Nevertheless, we do know some of the premises--provision for fuel, processing and depositing of irradiated elements: that is, the entire fuel cycle. This first and last phase of the fuel cycle of the first generation of nuclear power plants is already posing enough problems for the institutes.

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SECURITY, SAFETY AT RINGHALS NUCLEAR POWERPLANT

Copenhagen INFORMATION in Danish 31 Jul 79 p 3

[Commentary by Flemming Roder]

[Text] "A nuclear powerplant consists of approximately 1 million different components. So it is a statistical necessity that approximately one mishap occurs every hour in any nuclear powerplant", says Bjorn Karlsson, a professor of reactor technology at the Chalmers University. "No technician believes that any safety system will function if the worst accident that is conceivable happens," says a Swedish reactor technician, and the man in charge of physical security thinks that the concrete reinforcement should be sufficient to withstand a shell or two.

The six nuclear powerplants which are operating in Sweden now were out of operation a total of 968 hours during the first quarter of this year because of technical shortcomings and interruptions. (A quarter has 2,160 hours).

INFORMATION is in possession of a report on technical security and safety at the Ringhals nuclear powerplant on the western coast of Sweden, south of Goteborg.

The report covers all technical shortcomings at the two reactors, Ringhals I and Ringhals II, from 1975 through the first quarter of 1979. During that period, the two reactors were out of operation a total of 341 times because of technical breakdowns. According to the National Nuclear Power Inspectorate, which prepared the report, a total of 99 breakdowns or disturbances took place at Ringhals which "caused or could have caused a reduction in the functioning of systems which are important for security and safety--that is, shortcomings in reactors or in systems which support reactor operation, and shortcomings in turbines or generators."

Therefore, technical security and safety constitute a big problem at the powerplant in Ringhals, even in relation to so-called normal operation. "The problem is not, as many people believe, the really big breakdowns and the consequences of them as they affect the environment," a reactor technician told INFORMATION. "Such breakdowns have not taken place here,

and there are no technicians who believe that any safety system will function if the so-called worst accident that is conceivable--a reactor meltdown--happens."

The report from the National Nuclear Power Inspectorate gives a detailed description of every single breakdown, as in the following example:

"...in late June, it was discovered, during an inspection of a reactor tank, that there were large cracks in the feed train (stainless steel) [fodevandsring]. Feed water rings were placed around the inside of the reactor tank for the purpose of distributing feed water during fission to the mother reactor tank. The ring had a rectangular cross section with a big difference in the thickness of the material between the high side plates (5 mm) and the gables (25 mm). Sometimes long cracks were found along the welds between the side plates and the gables, and sometimes there were smaller cracks at the discharge holes. The extent of the damage resulted in a quick decision to replace the feed water ring with a water distributor of another type."

"Both the work of removing the old ring and the installing of the new one involved hard, time-consuming work. A special screen for protection against radiation in the form of a box with thick lead sides was built. The various elements of the job were carried out from that box, which was sunk down in the reactor tank. Each task was carefully practiced in a dummy layout. The operators participating received special training. Detailed descriptions of the work and lists of the operations to be performed were prepared for the various operations. The work itself was observed with television cameras and recorded on video tape. The work was checked extensively, and the final check was performed by the Technical X-Ray Center. In all, 117 men from 13 firms took part. Of these, 55 worked in the box with protection against radiation. Just the replacement of the feed water distributor took 5 weeks...."

Similar reports describe larger and smaller breakdowns at the two Ringhals reactors.

Normal "Waste"

Since there are about 1 million different components in a nuclear powerplant, "it is a statistical necessity" that approximately one mishap occurs every hour. Because of the danger of radiation, one cannot go near the reactor itself while it is in operation--that is, while the process of fission is going on. Therefore, all its functions are controlled and checked by means of electronic instruments in a sort of "blind flying" process.

Despite all the safety measures which are taken, it is impossible to prevent a certain amount of dispersion of radioactivity from the nuclear powerplant both in the air and in the water. Because of the big variations in temperature in nuclear fuel, it is broken up under certain circumstances

and the highly active products of fission leave the reactor in gaseous form. Because of the big variations in temperature in the fuel rods for nuclear fuel, they crack under certain circumstances, and the product of fission, which is very active, leaks out in gaseous form. Also, during normal operation, the so-called medium-active waste is there which consists of common dirt, rust and other things which can get stuck in filters and other places. These waste products are mixed in concrete which is stored at the nuclear power plant, in the expectation that its activity will decrease. There are no regulations in Sweden which prescribe a specific way of dealing with these products. "People" believe that it takes 30 years for the radioactivity to go away, and in Sweden there are plans to use them as filling for road surfaces.

In principle, waste of low activity is everything that has been inside the nuclear power plant--wooden shoes, tools, rags, clothing, components which have been replaced, etc. Actually, only theoperating personnel are not included, for purely technical reasons, in "low-activity waste."

Eight Additional Cases of Cancer

The consequences of the radioactive radiation which occurs exclusively in connection with normal operation can be made clear in the following manner:

People are constantly exposed to a radioactive radiation of 100 millirem which comes from space, the earth and human beings themselves. In addition to the normal radiation, we are also exposed to radiation from building materials and various other articles in "the life of everyday", and also from X-ray treatments. For an "ordinary" human, that radiation amounts to an additional 100 millirem. In regard to nuclear power plants, the rule is used in Sweden that people who live in the vicinity of such a powerplant must not be exposed to additional radiation of more than 50 millirem.

According to Professor Bjorn Karlsson, the consequence of the operation of the Swedish nuclear power plants is that, with a certain amount of pessimism, one has to expect 8 additional cases of cancer per year. In a transmission to schools just recently put out by the Swedish TV-2 network, Bjorn Karlsson said, "If we have a soccer field with thousands of people and a Jumbo Jet crashes, we will have to take the consequences, and they would be considerably worse than with a reactor leakage. Nevertheless, people will continue to go to soccer games."

The Worst That Is Conceivable...

The Swedish authorities have a special requirement which they make in connection with the construction of nuclear power plants. The worst accident that is conceivable, which the designers are to take into consideration, is the following:

A leak in the pipes of the cooling system which regulates the power in the reactor. It is assumed that there is a free discharge and the supply

of electric power fails at the same time, while the emergency cooling system is also out of operation. The results will be: an increase in pressure in the reactor building because of escaping steam, a lightning-fast cessation of the chain reaction in the nuclear fuel, and then a sharp increase in temperature in the reactor. Also, all pumps will stop because of the failure of the electric power and all water tanks will be empty. The requirement at that time is that the diesel-engine generators will go into operation after at least 15 seconds have passed. After 20 seconds have passed, the pressure in the reactor is subsequently to be reduced to its normal state.

The first part of the 30-minute rule existing in Sweden states that no humans are to intervene during the first 30 minutes after the worst accident that is conceivable has taken place.

Afterwards, several weeks of cooling down of the reactor follow before humans can go into the reactor building and begin repair work. On condition that these safety and security systems work, radioactive leakage will be relatively limited, according to the Swedish authorities.

The designers planned the safety and security systems to conform with this requirement.

From the Fence and On In

But the questions that are asked in connection with nuclear power are not concerned exclusively with technical safety and security. All Swedish nuclear power plants have a 2-kilometer physical-safety zone running all the way around the installation. However, that is not the case with the Ringhals nuclear power station.

INFORMATION paid an unannounced visit to Ringhals last weekend. After our return to Copenhagen, we telephoned the chief of physical security at Ringhals, Mr. Molander. We expressed our surprise to him that we had been able to go unhindered, as we did do, all the way up to and all the way around the fence for that enormous nuclear power plant. We did not conceal from the chief of security our disappointment at not being challenged--familiar as we are with the rigorous security conditions and the 2-kilometer zone from several visits to other Swedish nuclear powerplants. The chief of security said, "I have received a report that you were here. It is here on my desk. But you did not do anything illegal, and therefore we did not ask the police to step in. Certainly it can be difficult to see from a distance the difference between a camera with an 800 mm lens and a Carl Gustav missile launcher, but the concrete reinforcement around the reactor should be sufficient to withstand a shell or two."

"What about the 2-kilometer safety zone which all other nuclear powerplants in Sweden have?" he was asked.

"We are testing something new here," he replied. "Actually, we have an excellent relationship with our neighbors here in Ringhals. We do not think the rigorous security measures which have been talked about so much in connection with the debate on nuclear power are necessary."

The security chief alluded to one of the weightiest arguments of the opponents of nuclear power--namely, "that nuclear power develops a totalitarian society in which the danger of terrorist acts can provide the motivation for police activities on a scale which has been unknown up to the present time."

"We are only interested in what goes on inside the fence," the security chief told INFORMATION.

Indeed, INFORMATION's people did not encounter any "resistance" outside the fence. No policemen seized us by the arm and no police dogs bit us in the legs. Everything was peaceful and quiet, and the blue and yellow flag flapped in the wind.

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GOVERNMENT ESTABLISHES URANIUM PROCUREMENT DIRECTORATE

Melbourne THE AGE in English 30 Jul 79 p 15

[Text]

LONDON, July 29. — A national agency to acquire uranium for Britain has been set up by its three main power generating organisations.

The Civil Uranium Procurement Directorate, as it will be know, will be responsible for buying uranium overseas and for joint ventures into mining.

The announcement of the directorate came a day after the British Government signed a uranium safeguards treaty with Australia, clearing the way for its sale.

But the directorate's chairman, Mr. Fred Bonner, said that, although the two coincided, the directorate had been in the offing for a long time.

Its purpose was to "rationalise the team".

"In the past we have sent someone out to say, Ranger to negotiate and they haven't been sure whether they are dealing with British Nuclear Fuels or the Central Electricty Generating Board or what," Mr. Bonner said.

"Now we can negotiate on behalf of Britain".

The three organisations behind the directorate are BNF, the CEGB, which controls power supplies for all of England and Wales, and the South of Scotland Electricity Board.

Next year nuclear plants and atomic fuel facilities run by these institutions will need 2000 tonnes of uranium, worth £100 million ($A300) million.

Most of it will come from Namibia and Saskatchewan in Canada.

Britain hopes to buy about 1000 tonnes of Australian uranium annually but the first shipment is not expected to arrive until 1981.

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